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INTEGRATING SDGS IN LEGAL FRAMEWORKS TO ENHANCE CLIMATE RESILIENCE IN FOOD SYSTEMS FOR SUSTAINABLE DEVELOPMENT

INTEGRACIÓN DE LOS ODS EN LOS MARCOS JURÍDICOS PARA AUMENTAR LA RESISTENCIA CLIMÁTICA EN LOS SISTEMAS ALIMENTARIOS PARA EL DESARROLLO SOSTENIBLE

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Abstract:

The increasing effects of climate change on global food systems call for well-thought-out legal actions. The study investigates the interplay between climate change, legal frameworks, and sustainable food production, emphasizing how laws can facilitate or obstruct sustainability objectives. It begins by addressing the challenges that climate change imposes on food cultivation, distribution, and security, underscoring the vulnerability of agricultural sectors to climatic fluctuations and the ensuing risks to food availability and accessibility, which are crucial to the Sustainable Development Goals (SDGs). The research proceeds with a comprehensive evaluation of existing global, national, and local legal mechanisms and policies, assessing their effectiveness in promoting sustainable practices and mitigating climate impacts. A critical component of this analysis is identifying deficiencies within legal frameworks that hinder the

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achievement of SDG objectives related to sustainable agricultural practices and climate initiatives. The paper examines aligning food-related laws with environmental sustainability principles and proposes amendments to current regulations and new policy recommendations for improved outcomes. In conclusion, the paper underscores the necessity of integrating SDG principles into legal structures to enhance the resilience of food systems against climate change.

Resumen:

Los crecientes efectos del cambio climático en los sistemas alimentarios mundiales exigen medidas jurídicas bien pensadas. El estudio investiga la interacción entre el cambio climático, los marcos jurídicos y la producción sostenible de alimentos, haciendo hincapié en cómo las leyes pueden facilitar u obstaculizar los objetivos de sostenibilidad. Comienza abordando los retos que el cambio climático impone al cultivo, la distribución y la seguridad de los alimentos, subrayando la vulnerabilidad de los sectores agrícolas a las fluctuaciones climáticas y los consiguientes riesgos para la disponibilidad y accesibilidad de los alimentos, que son cruciales para los Objetivos de Desarrollo Sostenible (ODS). La investigación procede a una evaluación exhaustiva de los mecanismos jurídicos y las políticas mundiales, nacionales y locales existentes, evaluando su eficacia en la promoción de prácticas sostenibles y la mitigación de los impactos climáticos. Un componente fundamental de este análisis es la identificación de las deficiencias de los marcos jurídicos que obstaculizan la consecución de los objetivos de los ODS relacionados con las prácticas agrícolas sostenibles y las iniciativas climáticas. El documento examina la armonización de las leyes relacionadas con la alimentación con los principios de sostenibilidad medioambiental y propone enmiendas a las normativas actuales y nuevas recomendaciones políticas para mejorar los resultados. En conclusión, el documento subraya la necesidad de integrar los principios de los ODS en las estructuras jurídicas para mejorar la resiliencia de los sistemas alimentarios frente al cambio climático.

Keywords: Sustainable Development goals. Climate change. Food laws. Sustainability. Agriculture.

Palabras clave: Objetivos de desarrollo sostenible. Cambio climático. Legislación alimentaria. Sostenibilidad. Agricultura.

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1. INTRODUCTION

The world is currently facing a significant crisis that links the stability of our climate to the security of our food systems. With climate patterns becoming more unpredictable, adapting our agricultural methods and food distribution systems is crucial to cope with these changes. This urgency is heightened by the increasing global population, which is projected to reach nearly 10 billion by 2050, according to the United Nations, leading to a higher demand for food in a world where sustainable resources are becoming scarce(Birch-Jeffrey 2021). Climate change directly impacts food security by affecting food production conditions, availability, access, and utilization(Gitz et al. 2016). The rise in temperatures, shifts in precipitation patterns, and more frequent extreme weather events like droughts and floods all contribute to decreased agricultural productivity and water availability. These changes jeopardize the quantity and

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quality of food produced, posing risks to food safety and nutritional well-being. In this intricate situation, legal frameworks play a vital role beyond governance; they are essential for survival and sustainability(Grossman 2022). Effective legal structures can promote sustainable farming practices, regulate natural resource usage, safeguard biodiversity, and ensure fair access to food. However, despite their potential, many current legal systems are not fully prepared to deal with the complex challenges brought about by climate change. There exists a significant disparity between the capabilities of existing laws and the changing requirements of food systems in the face of a shifting climate.

2. SUSTAINABLE DEVELOPMENT GOALS- A CALL TO ACTION

The introduction of the Sustainable Development Goals (SDGs) by countries within the United Nations in 2015 offered a comprehensive plan for tackling global issues such as poverty, inequality, climate change, environmental harm, and peace. Within the framework of sustainable development, SDG 2 (Zero Hunger) and SDG 13 (Climate Action) specifically address the critical intersection of climate change and food security (Sporchia et al. 2024).

These goals highlight the necessity for an integrated approach that manages both the immediate impacts of climate events on food production and ensures the long-term sustainability of food systems. SDG 2 aims not only to eliminate Hunger but also to secure food availability, enhance nutrition, and promote sustainable agricultural practices(Holle 2021). SDG 13 calls for urgent actions to combat climate change and its impacts, including those affecting food production systems. The interplay between these goals emphasizes the need for legal frameworks to address the multifaceted challenges of food security in a changing climate(Filho et al. 2023). Climate change has spurred the adoption of eco-friendly practices within the food industry. Despite the urgent need for action, there remains a gap in developing an environmental policy framework tailored to the food sector. The European Food Safety Authority (EFSA) has highlighted that while numerous studies have explored the effects of climate change on food security, few have examined issues related to food safety and nutritional quality(Liu, Moy 2023). The connections between SDG 2 and SDG 13 underscore the importance of creating and implementing legal frameworks that comprehensively address the varied challenges posed by climate change to food security. Such frameworks must support sustainable agricultural practices, enhance food safety, and ensure nutritional quality, fostering a resilient food system capable of withstanding climate-related disruptions. In tackling sustainability challenges. As defined by the United Nations in 1987, it is

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"development that caters to needs without jeopardizing future generations' ability to meet their own needs"(UNDESA 2009)

Nevertheless, specific environmental strategies to address climate change are not consistently integrated into a legal structure. When looking at the European Union's stance on sustainability, Article 3 of the Treaty on the European Union (TEU) underscores sustainability as an objective(Parliament 2023)(Council of the European Union 2019). This article outlines the EU's dedication to development encompassing balanced economic expansion and price stability a competitive social market economy, full employment, social advancement, and a high standard of environmental protection and enhancement Furthermore, according to Article 114(3) of the Treaty on the Functioning of the European Union (TFEU), the Commission is required to prioritize a "level of protection" in its proposals for harmonizing laws especially those related to health, safety, environmental protection and consumer protection. The General Food Law (Regulation (EU) No 178/2002) establishes fundamental principles for food safety, including safeguarding animal health, welfare, plant health, and the environment (Article 5)(*Regulation - 178/2002 - EN - EUR-Lex*). Although these regulations reference development and environmental protection, they often do so in broad terms, with limited specific regulatory measures addressing these concerns. Food safety regulations consist of a combination of laws and private standards. A standard outlines criterion for products, processes, and producers, encompassing environmental, economic, and social factors necessary for certification of food production processes or products(Henson, Humphrey 2009). Private standards have emerged alongside public regulations to highlight and certify the sustainability aspects of products. These initiatives aim to bridge the gap between government regulations and consumers' growing demand for eco-friendly products. Voluntary private standards differentiate certified products or producers in the market through trademarks, logos, and symbols, informing consumers about the sustainability attributes of these products(Liu 2009). Higher consumer confidence is achieved through standards certified by third parties, reflecting the certifying body's impartiality. The ISO 14000 series, published by the International Organization for Standardization (ISO), is particularly crucial in combating climate change. This series provides guidelines for setting up an environmental management system to help organizations reduce their environmental impact and lower greenhouse gas emissions(International Standards Organisation 2015). In the wine industry, sustainability research focuses on managing issues such as greenhouse gas emissions in vineyards and implementing sustainable practices(Grimsrud 2023). It examines the indicators used in three projects, certified by third parties, to create a common framework for environmental indicators in the wine supply chain(Merli, Preziosi, Acampora 2018). These indicators serve as decision-making tools based on measurable facts and recognized standards monitored

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by accredited third parties, aiming to improve the environmental sustainability of products. Other notable certification programs in the food industry include GlobalGAP, which focuses on agricultural excellence; Friend of the Sea, advocating for ethical fishing methods; and the Roundtable on Sustainable Palm Oil, aiming to boost environmental sustainability within their sectors(Valero 2018). In addition to incorporating labels based on voluntary standards, food regulations can combat climate change and promote sustainable development by addressing food wastage. Since 2015, the European Union has actively promoted sustainability through the 2030 Agenda for Sustainable Development. This agenda builds upon the Millennium Development Goals (MDGs) and introduces the Sustainable Development Goals (SDGs) to be accomplished by 2030. Goal 12.3 aims to halve global food waste per person at the retail and consumer levels by 2030 and reduce food losses throughout production and supply chains, including post-harvest losses(UN 2015).

The Intergovernmental Panel on Climate Change (IPCC) has emphasized the necessity for changes in land use, agricultural practices, and eating habits to limit global warming to 1.5 degrees Celsius(The Intergovernmental Panel on Climate Change 2019). Climate change is already impacting the food system. Reducing food wastage addresses the direct effects of climate change and is crucial for reducing greenhouse gas emissions and improving food security. Notably, one-third of all food produced for human consumption is wasted. In 2013, discarded food contributed to a carbon footprint of 3.3 gigatonnes of carbon dioxide equivalent. If food waste were a country, it would rank as the third-largest emitter of greenhouse gases globally, just behind the US and China(Food and Agriculture Organization of the United Nations 2013). Despite the absence of a legal framework in the EU solely focused on addressing food waste, there is Directive (EU) No 98/2008 on waste that outlines a 'waste hierarchy' with five levels of action: prevention, preparing for reuse, recycling, recovery, and disposal(European Union 2020). In 2015, the European Commission introduced the 'Circular Economy Plan,' a plan covering the entire product life cycle—from production and consumption to waste management—and promoting the secondary raw materials market. With revised EU waste legislation from May 2018, EU countries are mandated to reduce food waste across all stages of the supply chain, monitor levels of food waste, and report their Progress(European Commission 2019a). Establishing the EU Platform on Food Losses and Food Waste aims to support the achievement of development goals. The Refresh project has been acknowledged as an initiative within the context of the EU Green Deal. While no legal framework explicitly targets food waste, existing regulations indirectly influence it. Rules related to marketing standards, contaminants, microbiological hazards, pre-market approvals, and claims all impact addressing food waste concerns. According to EU Regulation No. 1169/2011, known as the Food Information to Consumers (FIC)

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regulation, food items must have an expiration date, which can be labeled as either a 'best before' or a 'use by' date. The 'best before' date signifies the estimated period during which the food is expected to maintain its quality in terms of taste and nutritional value(Union 2011). On the other hand, the 'use by' date indicates the deadline by which the food should be consumed for safety reasons; beyond this date, consuming the food is considered legally unsafe. Confusion surrounding these two types of dates can result in consumers discarding food that's still safe for consumption. Furthermore, producers may determine these dates more based on marketing strategies or precautionary measures than genuine concerns about food safety.

2.1. SDG 13-Climate Action and its assessment

"Climate Action" is a crucial component of the United Nations Sustainable Development Goals (SDGs) that emphasizes the need for comprehensive measures to mitigate climate change and address its impacts(United Nations/Sustainable Development 2021). It calls for actions at all organizational levels to respond to this global challenge. The recent release of the Intergovernmental Panel on Climate Change (IPCC) Assessment Report (AR6) underscores the urgent need to tackle climate change drivers, mainly by reducing CO2 emissions(Lee, H. et alLee et al. 2022). The primary objective of SDG 13 is to enhance resilience and adaptive capacity to climate-related hazards and natural disasters in all countries. This goal considers events such as floods, droughts, heatwaves, wildfires, and other natural calamities, recognizing their significant impact on lives worldwide. Developing robust disaster risk management capabilities is essential to prevent or mitigate these climate-related events' consequences effectively. Another critical aspect of SDG 13 is ensuring that climate change strategies and solutions are well integrated into global policies(Filho et al. 2023). Government support for climate change initiatives and programs can significantly enhance a country's ability to adapt to climate challenges. Additionally, SDG 13 aims to increase education, awareness, and capacity-building for individuals and institutions to address climate change through adaptation and mitigation efforts. This includes interpreting early warning signals and implementing appropriate responses. SDG 13's financial goal is twofold- First, it seeks to ensure that developed nations mobilize $100 billion annually to assist developing countries in implementing adaptation and mitigation measures, thereby sustaining the Green Climate Fund(Ajibade, Egge, Pallathadka 2019). Second, it focuses on enhancing the capacities of developing countries and small island nations, with particular attention to women, youth, and marginalized communities(Filho et al. 2023). This effort is supported by the Global Reporting Initiative (GRI), which enables countries to report their contributions and establish accountability. SDG 13's interconnection with other SDGs is evident through binding agreements such as the United Nations

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Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol, the Doha Amendment, and the Paris Agreement(Advocates for International Development 2019). These agreements underscore the existing commitments to climate action. Climate change impacts various aspects of life, including reduced access to water, which affects public health (SDG 3), hinders income generation opportunities (SDG 1), and threatens food security (SDG 2). The comprehensive approach of SDG 13 aims to address these multifaceted challenges by promoting resilience, adaptive capacity, and integrated climate strategies worldwide(UN 2015). The COP 25 held in Madrid in 2019 paved the way for advancements in finance, agriculture, technology, capacity building, indigenous rights, and gender equality— areas heavily influenced by climate conditions(European Commission 2019b). However, COP 26 in Glasgow underscored those global efforts to reduce greenhouse gas emissions are insufficient to maintain a climate. Moreover, support for nations to address climate change remains inadequate. However, the recent COP26 conference did introduce some initiatives to advance the Paris Agreement's implementation, potentially steering the world towards a sustainable low-carbon future(United Nations 2021). Following COP27, in Sharm el Sheikh, Egypt, a groundbreaking agreement was reached to support nations severely impacted by climate-related catastrophes like floods and droughts. This decision was widely applauded as a milestone. These efforts are complemented by measures designed to decrease greenhouse gas emissions from activities and enhance climate resilience(*Five Key Takeaways from COP27 | UNFCCC*). Despite a 6% reduction in GHG emissions during 2020 due to COVID-19 lockdowns, experts warn that drastic reductions are required annually to limit warming to 1.5° C. While funding for climate initiatives has increased, it still falls short compared to investments in fossil fuels. The United Nations Climate Change Conference, the COP 28, concluded in Dubai, the United Arab Emirates, as the largest of its kind. Among the participants were 85,000 people, more than 150 Heads of State and Government representing national delegations, civil society, business, indigenous people, youth, philanthropy, and international organizations(United Nations Framework Convention on Climate Change 2024). The summit had been taking place in the city from 30 November to 13 December 2023. COP 28 was particularly seen as a landmark conference, in that it concluded the completion of the first "global stock take" of efforts across the world to respond to climate change, a process under the Paris Agreement. The stocktake had shown that Progress was too slow in all areas of climate action, which span from reducing greenhouse gas emissions to strengthening resilience to change and getting financial and technological support to vulnerable nations. It sees countries responding with a decision to increase ambition at least four times across all areas by 2030. Countries have also been challenged to shift much faster from fossil fuels to renewables such as wind and solar power in their new climate pledges.

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2.2. SDG goals and its Implementation

The Progress toward meeting disaster risk reduction targets varies between countries, highlighting the need for enhanced collaboration (SDG17). Air pollution (SDG3), water scarcity (SDG6), food security (SDG2), land use (SDG15), and sustainable energy (SDG7) are Development Goals connected to climate change(Filho et al. 2023). It's essential to consider climate issues in their implementation. Liu emphasize the advantages of efforts in implementing climate policies, stressing the need for policymakers to acknowledge the influence of factors on all interactions(Liu, Moy 2023). A recent UN review on SDGs implementation and goal interrelations revealed that economic growth, environmental protection, and social well-being are integrated across SDGs, applying to income and low-income countries(Filho et al. 2023). Therefore, addressing climate change is crucial to achieving social prosperity. Recognizing co-benefits, such as climate benefits resulting from climate actions, plays a vital role in climate policies by fostering improvements in energy and forest conservation areas. However, it's essential to consider trade-offs. Risks, like increased energy costs or heightened food insecurity. Cohen stresses the importance of considering outcomes and potential drawbacks, known as co-impacts, when taking climate actions. The goal is to maximize the benefits while minimizing any effects. It is also crucial to look for ways to achieve objectives simultaneously(Cohen et al. 2021). Each of the 17 Development Goals (SDGs) has connections with climate change, with some having no conflicts, such as SDGs 3, 4, 5, 12, and 13. Natural disasters impact millions of people, and improving disaster risk management skills to reduce their adverse effects is essential. SDG13 also emphasizes the importance of incorporating climate change strategies into global policies, encouraging governments to support initiatives that address and adapt to climate change(Filho et al. 2023). Additionally, the goal focuses on raising awareness about climate change and educating communities and institutions on how to respond to it. SDG13 is committed to providing $100 billion to support developing countries in combatting climate change, focusing on assisting groups such as women, youth, and marginalized communities. The interconnectedness between SDG13 and other sustainable development goals is evident as combating climate change requires efforts that align with different objectives(Bruce M et al. 2018). International agreements like the UNFCCC Kyoto Protocol, the Doha Amendment, and the Paris Agreement highlight the commitment towards achieving SDG 13(CFR 2023). Climate change has far-reaching impacts, including water scarcity, health issues, economic challenges, and food security threats. COP 25 in Madrid (2019) and COP 26 in Glasgow underscored the need for investments, agricultural innovations, and technological Progress to

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address these challenges effectively(CFR 2023). The COP 27 gathering in Sharm el Sheikh stood out for its decision to assist nations significantly impacted by climate-related disasters(Chloé Farand 2022). With the decrease in greenhouse gas emissions due to the pandemic in 2020, current actions are insufficient to meet the required reductions for limiting warming to 1.5° C(One Earth 2020). Funding for fossil fuels continues to surpass support for climate initiatives, and advancements in reducing disaster risks are sluggish underscoring the importance of enhanced collaboration (SDG17). The execution of climate policies is intricately connected with sustainable development goals (SDGs), which address air quality, water scarcity, food security, land usage, and sustainable energy(*Synergy Solutions for a World in Crisis: Tackling Climate and SDG Action Together* 2023). These interconnected relationships emphasize the need for thought-out climate strategies that maximize benefits and minimize drawbacks. For example, while climate measures can enhance energy efficiency or preserve forests, they may also result in energy expenses or heightened food insecurity. Acknowledging and balancing these outcomes and potential drawbacks are essential for crafting climate plans that foster broader economic and societal well-being across diverse countries regardless of income levels(Abbass et al. 2022).

2.3. SDG 2-Zero Hunger and its assessment

SDG 2, also known as Zero Hunger, aims to eradicate Hunger and promote sustainable farming practices. Despite global food production, the UN Food and Agriculture Organization (FAO) reported in 2019 that more than 2 billion individuals lacked consistent access to safe, nutritious, and adequate food(FAO, IFAD, UNICEF 2019). The situation has deteriorated due to the impact of the COVID-19 pandemic, which has disrupted food supply chains, increased poverty levels, and decreased consumer purchasing power. Additionally, the FAO warns that we are falling short of meeting SDG 2 objectives related to plant and animal diversity for sustainable agriculture. The expansion of industrial agriculture in World War II resulted in a significant decrease in wild and cultivated species diversity(FAO, IFAD, UNICEF 2019). A report from 2019 by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services emphasized that the decline of plant and animal varieties, along with their genetic diversity, poses a severe threat to global food security(IPBES 2019). This reduction undermines the system's ability to withstand pests, diseases, and climate change. Food insecurity is primarily associated with poverty rather than a scarcity of food. Despite projections indicating that the world population will reach around 9.7 billion by 2050, our current global food system can feed between 12 and 14 billion people(Food and Agriculture Organization of the United Nations 2009). However, People facing poverty and small-scale farmers in regions like Asia, Africa, and Latin America

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often struggle to access the necessary resources due to limited income and land ownership. Although various global regulations touch upon aspects of Sustainable Development Goal 2 (SDG 2), no cohesive international legal framework is specifically dedicated to food and agriculture(Gonzalez, Leibman 2022). This chapter delves into human rights law and international economic law, which are deemed most pertinent in pursuing SDG 2 objectives. It contends that international human rights law aligns with the aims of SDG 2. Nonetheless, international economic law—covering trade, investment, and financial realms—often hinders these objectives by exacerbating poverty, displacing farmers from their lands, and promoting chemical industrial agriculture, contributing to greenhouse gas emissions. When legal spheres collide, international economic law typically takes precedence, enforced rigorously through mechanisms such as the World Trade Organization's (WTO) dispute resolution system and investor-state arbitration within international investment agreements (IIAs)(Gonzalez, Leibman 2022). We must examine the colonial era to understand the origins of Hunger and unsustainable farming practices truly. European powers significantly increased their prosperity by exploiting the resources of their colonies, converting vast lands in Africa, Asia, and the Americas from producing food for local consumption to growing cash crops for European benefit. Infrastructure such as roads and railways were developed to facilitate the transportation of these cash crops to coastal ports for export, not to support local economies. After achieving independence, countries in Africa, Asia, and Latin America were integrated into the global economy on unequal terms, specializing in exporting raw materials while relying on Europe and America for manufactured goods. This heavy reliance on exports made these countries vulnerable to global commodity price fluctuations and economic difficulties arising from low export prices and high import costs. In the post-World War II era, countries like the United States and European nations heavily subsidized their agricultural sectors to ensure food security and protect them from international competition through tariffs and trade barriers. These practices were permitted under the 1947 General Agreement on Tariffs and Trade (GATT), which did not subject agriculture to its trade liberalization standards(*The landscape of trade policy in food and agriculture* 2022). The resulting surplus food was often donated or sold at lower prices to nations in the Global South, undermining local farmers by reducing prices and weakening their ability to sustain themselves, leading to land loss and creating more landless workers in rural areas. During the 1960s and 1970s, the United States promoted its industrial farming model in the Global South during the Cold War era(Grossman 2022). This approach, known as the Green Revolution, introduced high-yield seed varieties alongside chemical fertilizers and pesticides. While it significantly increased food output, it displaced traditional and environmentally friendly farming practices, leading to a reliance on Western-made agricultural supplies. Although the Green

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Revolution boosted food production faster than population growth, it exacerbated inequality by benefiting wealthy large-scale farmers who could afford modern technologies. In contrast, smaller farmers struggled to compete and were driven into poverty(United Nations Convention to Combat Desertification 2017). The transition to industrial agriculture has resulted in various adverse environmental consequences, such as a significant reduction in crop genetic diversity, increased dependence on fossil fuel-based resources, severe soil erosion, aquifer depletion, and higher greenhouse gas emissions. In the latter part of the 20th century, approximately 75% of global food crop diversity dwindled as farmers shifted from diverse local crops to more consistent high-yield types(Dilly 2024). To meet the objectives outlined in SDG 2, which prioritizes food security and sustainable agriculture, it is crucial to enhance the well-being of small-scale farmers in developing regions and promote eco-friendly farming methods. This includes supporting traditional agricultural practices that are environmentally sustainable and reducing reliance on chemical inputs and fossil fuels(Huck 2023).

3. THE INTERLINKAGE BETWEEN SDG 2 AND SDG13

SDG 2, Zero Hunger, and SDG 13, Climate Action, are components of the 2030 Sustainable Development Agenda, and they are closely intertwined. The relationship between these objectives poses challenges stemming from their shared focus on sustainable development. Farming is at the core of this link, which is crucial in ensuring food security and addressing climate change. Through soil management and efficient agricultural practices, sustainable farming lowers greenhouse gas emissions, underscoring a joint commitment to advancing sustainable agriculture and sound soil practices.

Climate change's impact on food security directly leads to reduced crop yields and agricultural losses. Therefore, both SDG 2 and SDG 13 stress the need for strategies to ensure continued access to adequate food despite the unpredictable climate shifts(Lile, Ocnean, Balan 2024). Furthermore, the environmental repercussions of food wastage further intertwine these objectives. The production and transportation processes of wasted food significantly contribute to greenhouse gas emissions. Hence, tackling food loss is crucial for alleviating Hunger and addressing climate change concerns, emphasizing the pressing requirement for initiatives supporting food systems alongside climate targets. Sustainable farming practices are essential in addressing climate change by reducing greenhouse gas emissions through soil management and implementing more efficient agricultural methods(United Nations 2024). Both SDG 2 and SDG 13 prioritize promoting agriculture and effective soil management. Climate change's impact on food security significantly leads to

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food production and crop losses. In response, SDG 2 and SDG 13 aim to help communities adapt to these challenges and ensure food security despite the changing climate. Furthermore, food wastage affects the environment, contributing to greenhouse gas emissions during production and transportation. Both SDG 2 and SDG 13 stress the importance of minimizing food loss and waste while transitioning towards a food system to combat this issue(Gyimah, Saalidong, Nibonmua 2023). Integrating energy is crucial in reducing greenhouse gas emissions and tackling climate change. SDG 2 and SDG 13 promote using energy sources in agriculture and other sectors to support these initiatives. In summary, there is a correlation between SDG 2 and SDG 13 as they address critical issues collectively. By advocating for eco-farming techniques, enhancing soil care, adjusting to climate shifts, cutting down on food wastage, and adopting renewable energy sources, we can achieve the common objectives outlined in these Sustainable Development Goals. These initiatives are crucial for establishing a food system that guarantees food safety and reduces its ecological footprint. The Sustainable Development Goals set by the United Nations aim to tackle poverty, preserve the environment, and ensure peace and prosperity by 2030. Among these goals, Zero Hunger and Climate Action are closely linked, addressing food security and climate change issues. Zero Hunger aims to eradicate Hunger and achieve food security, improve nutrition, and promote sustainable agriculture(Sporchia et al. 2024). On the other hand, Climate Action focuses on urgent measures to address climate change impacts. The intersection of these two goals lies in the sector, which is impacted by and contributes to climate change. Agriculture relies heavily on weather conditions, making it vulnerable to shifts caused by global warming that can harm crop production, disrupt food supply chains, and increase pest outbreaks and diseases—ultimately affecting food security. The Food and Agriculture Organization (FAO) reported that more than 820 million people globally suffered from insufficient food in 2018, highlighting the pressing need for resilient food systems that adapt to changing climates. Moreover, between 2007 and 2016, agriculture, forestry, and related land activities contributed around 23% of the human-caused greenhouse gas emissions(FAO, IFAD, UNICEF 2019). These emissions stem from deforestation, agricultural practices, and methane release from rice fields and livestock.

3.1. Linking Agriculture to SDG 2 and SDG 13-

Sustainable agriculture offers various solutions to address climate change challenges. By embracing friendly, economically feasible, and socially equitable practices, sustainable agriculture aims to-

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- Boost Food Production- Implementing innovative sustainable farming techniques can enhance biodiversity, improve soil quality, and make farms more resilient to extreme weather conditions—ultimately increasing productivity.

- Lower Greenhouse Gas Emissions- Using resources (such as water, energy, and fertilizers) and promoting organic farming methods, sustainable agriculture can significantly reduce emissions in the agricultural sector.

- Promote Carbon Sequestration- Practices like agroforestry cover cropping and reduced tillage can enhance carbon storage capacity that helps counterbalance some of the sector's emissions.

The System of Rice Intensification:

This approach has raised rice yields while conserving water resources and decreasing methane emissions by up to half. It shows how adjusting methods can lead to increased efficiency and environmental friendliness. In Kenya, farmers have incorporated trees into their farming practices, resulting in crop yields due to shade provision and reduced soil erosion. This approach has also boosted carbon sequestration, aiding in reducing greenhouse gas emissions(Farm Africa 2023).

Obstacles in Connecting Development Goals 2 and 13-

Despite the potential advantages, various hurdles impede the full realization of these connections(Lile, Ocnean, Balan 2024)-

- Financial Obstacles- Shifting to sustainable agriculture often demands initial investments that many small-scale farmers cannot manage without financial aid.

- Policy and Institutional Challenges: Inadequate policy frameworks and weak institutions are ineffective. Incentivize sustainable practices.

- Knowledge and Technology Limitations: Limited access to knowledge and modern technologies hinders farmers from implementing agricultural techniques efficiently.

Approaches for Improved Integration

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To enhance the link between Sustainable Development Goals 2 and 13, the following strategies could be put into practice-

- Policy Alignment: Policies should be harmonized to back agriculture and climate resilience, establishing a regulatory environment that encourages sustainable practices.

- Supportive Financial Measures: Offering benefits, like subsidies, funding, and affordable loans, can assist in overcoming the financial challenges of embracing sustainable practices.

4. EUROPEAN COMMISSION ON FOOD, CLIMATE CHANGE AND FARMING

European Commission's vision in 2017 for how it sees the future Common Agricultural Policy (CAP) in view of the new challenges and opportunities for food and farming. The CAP constitutes the most important EU policy, which guarantees food security, supports farmers' incomes, and rural development(Commission 2017). It identifies key areas for reform and strategic objectives to make the CAP more effective, modern, and sustainable.

Setting the Scene

The EU's agriculture forms an essential part of its economy and preserves the environment. It provides food security for more than 500 million people and sustains significant employment directly in farming as well as in the related economic activities. However, the sector faces multiple challenges, among them being price volatility, natural disasters, and climate change. It is also important that the farming population has aged; hence, the need for more young, innovative farmers to drive the sector in the future.

Towards a New Delivery Model

A vital proposed reform is the new delivery model for the CAP, which focuses on simplification and making resources easier to use. The model is meant to give Member States more flexibility in designing CAP interventions according to their specific needs, but at the same time, ensuring alignment with overarching EU goals. A simplified CAP would imply a reduced administrative burden to the competent authorities and the beneficiaries and enhancement of the efficiency and effectiveness of agricultural support.

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Smarter, Modern, and Sustainable CAP

Research and Innovation

In the document, it is identified that research and innovation will play a crucial role in driving agricultural progress. Further technological advancement in agronomy, breeding, and digital farming should boost resource efficiency while reducing environmental impacts. However, the adoption of new technologies is generally lagging in the EU, particularly in small and medium-sized farms. Hence, the reform of the CAP must facilitate access to innovations for all farmers, rich and poor. Access to progress in agricultural science and technology must be assured.

Fostering a Smart and Resilient Agricultural Sector

CAP measures should ensure fair income support to farmers and contribute to their resilience against economic uncertainties and climatic stresses. Enhanced market rewards for resilient practices and risk mitigation through investment in market development, risk management tools, and financial instruments are required. The CAP must also promote climate-smart farming in line with EU climate and environmental targets.

Bolstering Environmental Care and Climate Action

Agriculture acts as both a driver of and a solution to climate change effects. To deal with this, the CAP must help shift toward sustainable agriculture to protect natural resources and lower greenhouse gas emissions. This entails embedding higher environmental standards within CAP measures and promoting biodiversity and soil health management and practices that protect and enhance water quality. The green architecture of the CAP will be reformed to ensure target orientation and ambition by delivering measurable environmental outcomes.

Strengthening the Socio-Economic Fabric of Rural Areas

Rural areas are very significant for the EU social-economic stability: a reservoir of labor, recreation, and tourism opportunities. The CAP should support the development of the rural economy by fostering growth and jobs, especially in areas with demographic decline and economic stagnation. It is very important to attract new farmers to be able to stimulate rural development, primarily from the young generation. This can be achieved through support for skills development and business start-ups and increased access to finance.

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Addressing Citizens' Concerns

The CAP must respond to the concern of the citizens about food safety, quality, and sustainability. Citizens are increasingly demanding transparency and a number of other aspects in the production of food with respect to organic farming, animal welfare, and less food wastage. The CAP should support initiatives that reflect these values, hence ensuring agricultural practices that live up to the concerns and preferences of the evolving EU citizens.

The Global Dimension of the CAP

The impact of the CAP goes beyond the borders of the EU and affects the global food market and world trade. The policy must develop the position of the EU in the world agricultural trade, being at the same time a promoter of worldwide sustainable conduct. The policy also needs to address migration and its causes, as rural development and employment offer opportunities in the country while linking the CAP to the main policies of the EU on migration and international collaboration.

The European Green Deal aims to make Europe the first climate-neutral continent by 2050, with the Farm to Fork Strategy as a core component. This strategy focuses on sustainable food production, ensuring food security, and promoting sustainable consumption. It also targets reducing food waste, combating food fraud, and fostering a global transition towards sustainable practices. Key to this transition are research, innovation, technology, and investments, along with advisory services and knowledge sharing. The strategy emphasizes a fair transition that benefits all, particularly in the wake of the COVID-19 pandemic and economic challenges. It aims to secure sustainable livelihoods for primary producers, underscoring their crucial role in recovery and transition. The pandemic highlighted the need for resilient food systems that guarantee access to affordable food. The strategy interlinks health, ecosystems, supply chains, and consumption patterns to create a more sustainable and resilient food system(Commission 2022). Consumer empowerment is another focus, encouraging sustainable food choices and responsibility across the food chain. The strategy aims to create an environment that makes it easier for consumers to adopt healthy and sustainable diets, improving health and reducing societal health costs. It rewards those who have transitioned to sustainable practices and supports others in making the shift, opening new business opportunities. Addressing food systems as drivers of climate change, the strategy targets reducing pollution, greenhouse gas emissions, and biodiversity loss. It aims to decrease reliance on pesticides and antimicrobials, increase organic farming, and improve animal welfare. The goal is to make European food a global standard for sustainability, building on its

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reputation for safety, nutrition, and quality. The Commission plans to elevate the greenhouse gas emission reduction target to 50-55% below 1990 levels by 2030. This presents a 'first mover' opportunity for all actors in the EU food chain, requiring changes in consumption patterns, reducing food waste, and addressing food insecurity. European diets, with 20% of food wasted and rising obesity rates, contribute to environmental footprints and health issues. The strategy aims to align diets with national recommendations, reducing the environmental impact. Globally, the EU seeks to set sustainability standards and promote policies to elevate them worldwide. The strategy emphasizes reducing the food system's environmental and climate footprint while ensuring food security. Legislative initiatives will support this transition, promoting coherence and financial assistance from EU instruments(Commission 2020). Commitments to halve food waste per capita by 2030 will be enforced, integrating prevention in EU policies and revising date marking rules. Stricter measures against food fraud will ensure a level playing field and enhance control and enforcement. Significant investments in research and innovation will accelerate the transition to sustainable food systems, with advisory services and data sharing playing crucial roles. Globally, the EU will support sustainable agri-food systems through international cooperation and trade policy. The strategy aims to promote sustainable agri-food practices, support small-scale farmers, and improve nutrition and food security. Emphasis will be placed on climate change adaptation, sustainable landscape management, and inclusive value chains. Legislation to combat deforestation and overfishing will be proposed, promoting sustainable plant protection and engaging with trading partners for global sustainable food systems. The EU aims to set a global standard for sustainability, involving public authorities, the private sector, NGOs, and citizens. Regular monitoring and data collection will assess progress, with the strategy implemented coherently with other Green Deal elements. The shift to sustainable food systems could create economic value and restore ecosystems, prioritizing reduced environmental and climate footprints. The CAP and its funding mechanisms are crucial, with efforts to support sustainable agriculture and fisheries. Research and innovation will drive sustainable food systems, with collaborative efforts to enhance human capital and competitiveness. By 2023, a legislative framework will promote sustainable food systems, focusing on reducing pesticide use, improving animal welfare, and promoting sustainable food consumption.

The Russian invasion of Ukraine has severely disrupted global agricultural markets, compounding the challenges already posed by the COVID-19 pandemic and climate change. The latest IPCC report underscores increasing threats to food security due to climate-related issues(Lee, H. et alLee et al. 2022). While the EU remains largely self-sufficient for key agricultural products, the invasion and global commodity price surges are driving up prices and exposing

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vulnerabilities, especially regarding imports of energy, fertilizers, and animal feed. This situation is affecting consumer purchasing power and raising concerns about food prices. The war in Ukraine has also disrupted crucial trade flows of cereals and oilseeds, significantly impacting global food security and commodities markets, particularly wheat. In response, the European Commission has introduced short-term measures to support food security in Ukraine, address global food security concerns, and assist EU producers and consumers. This response aligns with the European Green Deal and the Farm to Fork Strategy, aiming for a sustainable and equitable food system.

The invasion's impact extends beyond Europe, posing serious consequences for global food security, especially in Ukraine and nearby food-deficit countries, necessitating urgent food aid and humanitarian assistance. The Commission is working with the FAO in Western Ukraine to support agricultural production and has planned a 25 billion hryvnia program to ease the economic shock. Additionally, EU farming organizations are providing direct assistance to Ukrainian farmers. The global food security situation is precarious, with price hikes affecting global food and fertilizer supplies, increasing the risk of undernourishment, and hindering progress towards Sustainable Development Goals(Ireland 2023). The EU is providing substantial financial support for humanitarian food assistance, pledging EUR 2.5 billion for international cooperation with a focus on nutrition. The EU is also addressing the global wheat shortage by contributing to production and export efforts, with prospects for a substantial winter wheat harvest in 2022(Commission 2022). The Commission monitors and analyzes food prices and food insecurity, focusing on humanitarian assistance and adopting a humanitarian-development-peace nexus approach. To support Ukraine, the EU has proposed a EUR 330 million emergency support program, aiming to increase resilience against hybrid threats and aid reconstruction. Future EU food security initiatives advocate against export restrictions and promote diversified food supplies, supporting a transformation towards resilient and sustainable food systems. Coordinated global measures are essential to address food prices and insecurity, providing humanitarian assistance where needed.

Although the EU is self-sufficient, affordability remains a challenge, particularly for low-income individuals. The European Food Security Crisis Mechanism has been established for crisis preparedness, emphasizing the importance of the Single Market for food security and safety. Social policy measures, like the Child Guarantee and FEAD, support nutrition for vulnerable groups. To stabilize EU agricultural markets, the Commission incentivizes sustainable practices among farmers and offers targeted support to address input cost challenges. Monthly communication of stock levels is proposed for market transparency, with a EUR 500 million support package for producers affected by the war in Ukraine.

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Increased direct payments to farmers are also being implemented to address cash-flow issues(Commission 2022).

5. CONCLUSION AND SUGGESTIONS

The close connection between SDG 2, Zero Hunger, and SDG 13, Climate Action demonstrates the link between ensuring food security and building climate resilience(United Nations 2024). This article reveals that addressing Hunger is intertwined with combating climate change and vice versa. Sustainable farming emerges as an approach that connects these two objectives and strengthens them. The examination commenced by outlining the significance and urgency of these objectives(FAO 2016). Food security and climate issues intersect across various aspects of human and environmental dynamics. As climate change conditions lead to food insecurity, it calls for a shift in how we farm our lands and manage natural resources(FAO 2016). Embracing agricultural methods provides a robust solution to these intertwined challenges, showing promising impacts on both fronts. Throughout this research, evidence from data and real-life examples has emphasized that sustainable agricultural practices can boost food production while lessening the effects of climate change. Instances from regions have demonstrated that adopting techniques like the System of Rice Intensification or agroforestry leads to increased yields and improved resilience against climate variations, aiding in carbon storage and lowering greenhouse gas emissions(Wakweya 2023). However, the study also recognized the obstacles that stand in the way of fully realizing the potential of sustainable farming. Challenges such as barriers, policy gaps, and limited access to technology and knowledge pose significant hurdles. Overcoming these obstacles requires policy adjustments, investments in research and technology, and educational programs that empower farmers with the necessary expertise and resources(Siebrecht 2022). The suggested strategies to better integrate SDG 2 and SDG 13 involve aligning policies to support practices, strengthening financial mechanisms to facilitate shifts towards sustainable agriculture, and enhancing global collaboration on research and development. These steps are crucial for paving a way that meets immediate global food security needs and ensures the long-term sustainability of our planet's resources. This study highlights the need for a holistic approach to addressing hunger and climate change challenges. By advocating for farming practices, we are not just proposing technical solutions but calling for a fundamental change in how food production approaches and natural resources are conserved. This transformation is vital for our planet's health and the survival and well-being of all its inhabitants. The journey towards reaching Development Goal 2 and Sustainable Development Goal 13 is intricate and full of obstacles. However, the findings from this study offer a roadmap that can

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lead policymakers, stakeholders, and communities towards a sustainable and resilient future. As this research concludes, it becomes evident that the decisions we make today to blend climate action with hunger alleviation will shape the world we live in tomorrow. Sustainable agriculture serves as a means to achieve these SDGs and as a necessity for ensuring a stable, durable, and sustainable food system for future generations. By adopting the principles outlined in this paper, we can contribute to attaining the shared objectives of SDG 2 and SDG 13, thereby establishing a sustainable food system that guarantees food security while reducing adverse effects on our environment.

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